



**BONT TICK & TROPICAL BONT TICK
STANDARD OPERATING PROCEDURES:
1. OVERVIEW OF ETIOLOGY AND ECOLOGY**

FAD PReP

**Foreign Animal Disease
Preparedness & Response Plan**



**United States
Department of
Agriculture**

United States Department of Agriculture • Animal and Plant Health Inspection Service • Veterinary Services

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The Foreign Animal Disease Preparedness and Response Plan (FAD PReP) Standard Operating Procedures (SOPs) provide operational guidance for responding to an animal health emergency in the United States.

These draft SOPs are under ongoing review. This document was last updated in **April 2014**. Please send questions or comments to:

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Bont Tick and Tropical Bont Tick Etiology and Ecology Quick Summary

Organisms

The bont tick and tropical bont tick are hard ticks of the genus *Amblyomma*.

Susceptible Species

Adult ticks will feed on cattle, sheep, goats, horses, camels, dogs, and some species of large wildlife. They may also bite humans. Immature ticks may feed on the same hosts as adults but tend to be found on smaller mammals, reptiles, and wild birds.

Zoonotic Disease Potential

Tropical bont ticks are able to transmit certain diseases, such as African tick bite fever (*Rickettsia africae*), to humans.

Transmission

Pathogens use the tropical bont tick as a host, and disease is spread to an animal's blood through the tick's bite while feeding; among other diseases, the bont tick can spread the OIE-reportable disease heartwater (*Ehrlichia ruminantium*). The bite itself causes a large wound, which may become infected or attract other parasites to the site, such as screwworms.

Persistence in the Environment

Tropical bont ticks have three life stages where they change hosts and can live up to a few years. Immature individuals are vulnerable to drying out, and all ages can be killed with acaricides.

1.1 Introduction

The bont tick and tropical bont tick are two species of hard ticks in the genus *Amblyomma* that both feed on many domesticated animals, wildlife, and, sometimes, humans. Ticks are obligate parasites and thus cannot persist without feeding on blood from a host. These particular ticks leave large wounds where they bite, which can become infected or attract other parasites, and they also are vectors for microbial pathogens.^{1,2} The most common diseases associated with both ticks are African tick-bite fever and heartwater. African tick-bite fever is a zoonotic, febrile illness that can pose a danger to people traveling into an endemic area.³ For more information on heartwater, please see the *FAD PReP SOP Overview of Etiology and Ecology: Heartwater*.

These ticks are common pests in many tropical and sub-tropical regions of the world. Both are found in parts of Africa, and the tropical bont tick is established on certain islands in the Indian Ocean, Atlantic Ocean, and Caribbean Sea. Bont ticks and tropical bont ticks feed on three hosts over their life cycles; each host is usually a different animal, and each may be a different species. Immature ticks tend to feed on small animals, including birds, while adults feed on large mammals, frequently including livestock.^{4,5}

1.1.1 Goals

As a preparedness goal, the Animal and Plant Health Inspection Service (APHIS) will provide etiology and ecology summaries on the bont tick and tropical bont tick and update these summaries at regular intervals.

As a response goal, the Unified Command and stakeholders will have a common set of etiology and ecology definitions and descriptions, to ensure proper understanding of the bont tick and tropical bont tick when establishing or revising goals, objectives, strategies, and procedures.

1.1.2 Further Information

This document is intended to be an overview, focusing on the bont tick and tropical bont tick. Additional resources on these organisms and the diseases they carry are listed in [Attachment 1.A](#).

These documents are available on the APHIS FAD PReP website (<http://www.aphis.usda.gov/fadprep>) or on the APHIS Intranet (<http://inside.aphis.usda.gov/vs/em/fadprep.shtml>, for APHIS employees).

1.2 Purpose

This document provides responders and stakeholders with a common understanding of the disease agent.

¹ Center for Food Security and Public Health, Iowa State University (CFSPH). 2006. *Amblyomma hebraeum* Technical Factsheet. http://www.cfsph.iastate.edu/Factsheets/pdfs/amblyomma_hebraeum.pdf.

² CFSPH (2). 2006. *Amblyomma variegatum* Technical Factsheet. http://www.cfsph.iastate.edu/Factsheets/pdfs/amblyomma_variegatum.pdf.

³ Jensenius M, Fournier PE, Kelly P, Myrvang B, Raoult D. 2003. African tick bite fever. *Lancet Infect Dis*. 3(9): 557-64.

⁴ CFSPH, 2006.

⁵ CFSPH (2), 2006.

1.3 Etiology

1.3.1 Name

The bont tick is also called the English bont tick and the Southern Africa bont tick; the tropical bont tick may also be known as the tropical African bont tick, Senegalese tick, or Antigua gold tick.^{6,7,8,9}

1.3.2 Species Characteristics

These ticks have the following taxonomy:¹⁰

- Family: Ixodidae
- Subfamily: Amblyomminae
- Genus: *Amblyomma*
- Species: *Amblyomma hebraeum* (bont tick) and *Amblyomma variegatum* (tropical bont tick)

1.3.3 Identification and Morphology

Both the bont tick and tropical bont tick are oval with a dorsal shield and long mouthparts. They are relatively large ticks, typically around 5 mm long but growing up to 20 mm when engorged. These along with many other ticks of the *Amblyomma* genus have striped legs and ornate scuta (dorsal shields). Females have a much smaller scutum than the male so that much of her dorsal surface is uncovered, appearing dark brown or black.

The scutum of an *A. hebraeum* male has pale, yellowish markings on a dark brown or black background (see Figure 1-1), while the *A. variegatum* males have more brightly colored orange or golden ornamentation. Distinguishing between species is best left to an expert when possible, as there are over 130 species of ticks in the genus *Amblyomma*.

The bont tick and tropical bont tick are both three-host ticks, meaning that they take a separate meal at each stage of their development: larva, nymph, and adult. Larvae of both species are much smaller and have only six legs. Nymphal ticks have eight legs and are more flattened and elongated.¹¹

⁶ CFSPH, 2006

⁷ CFSPH (2), 2006.

⁸ Pegram R, Indar L, Eddy C, George J. 2004. The Caribbean *Amblyomma* program: some ecologic factors affecting its success. *Annals of the NY Academy of Science*. 1026: 302-311.

⁹ Caribbean Animal Health Network. 2011. "Monograph: Heartwater." Available at <http://www.caribvet.net/en/diseases/heartwater/monograph>.

¹⁰ Guglielmone A, Robbins R, Apanaskevich D, Petney T, Estrada-Pena A, Horak I. 2014. *The Hard Ticks of the World*. Springer: New York.

¹¹ Lounsbury CP. 1899. The bont tick: Its life history and habits. *Agricultural Journal of Cape of Good Hope*. 15: 728-743.

Figure 1-1. Adult male bont tick, *Amblyomma hebraeum*



Source= Mat Pound/ USDA Agricultural Research Service

1.4 Ecology

1.4.1 General Overview

Bont ticks can be found throughout sub-Saharan Africa and the tropical bont tick is on several tropical and sub-tropical islands; these include, but are certainly not limited to, Madagascar, Reunion, Mauritius, Zanzibar, the Comoros Islands, São Tomé, Guadeloupe, Marie Galante, and Antigua. The bont tick prefers warm, humid savanna habitats of Africa.¹² Tropical bont ticks are also found in savanna regions, but their distribution extends to the southern edges of the Middle East and islands of the Caribbean Sea, Atlantic Ocean, and Indian Ocean.¹³

1.4.2 Susceptible Species

Small mammals, birds, and reptiles are hosts of larval and nymphal bont ticks, while adults tend to prefer cattle and wildlife, in particular antelopes or similar species. All stages of tropical bont ticks share hosts with bont ticks at corresponding stages, but they will additionally attach to larger livestock hosts while in their immature stages and to sheep, goats, horses, camels, and dogs.

While preferring wildlife and domestic ruminants, both tick species have also been known to bite humans.^{14, 15} People are at particular risk in areas of dense vegetation where ticks are endemic.¹⁶

1.4.3 Introduction and Transmission of Bont Ticks and Tropical Bont Ticks

Ticks of both species spend the majority of their lives on the ground. At all life stages, ticks find hosts by waiting in grass or on ground-cover plants, and clinging to the host animal as it passes

¹² CFSPH, 2006.

¹³ CFSPH (2), 2006.

¹⁴ CFSPH, 2006.

¹⁵ CFSPH (2), 2006.

¹⁶ Centers for Disease Control and Prevention (CDC). 2013. "African Tick-Bite Fever." <http://wwwnc.cdc.gov/travel/diseases/african-tick-bite-fever>.

by. Ticks spend 5-20 days feeding on the host during which they are disseminated to new areas by the movement of their hosts, dropping onto the ground when engorged. For example, the movement of livestock from island to island led to the wide distribution of the tropical bont tick throughout the Caribbean after its introduction to Guadeloupe from Senegal in about 1828.¹⁷

1.4.3.1 Wildlife

Migratory birds, particularly the cattle egret (*Bubulcus ibis*), have been identified as an important agent of dispersal of the tropical bont tick among islands in the Caribbean¹⁸; birds can carry immature ticks long distances and have presented a challenge to tick eradication programs in that region.^{19,20}

1.4.4 Clinical Signs

These ticks cause illness by inflicting bite wounds that are vulnerable to infection and by transmitting pathogens to their hosts; signs exhibited by a host depend on a number of factors, including host species and age, extent of tick infestation, previous exposure, and environmental factors.

- Bite wound: The large mouthparts of both tick species result in large, painful wounds. The bite sites can become infected or, in some regions, infested with screwworms or other fly larvae. As adults, ticks often latch onto hairless areas; inflammation caused by bites on the teats of dairy animals may impede milk production.²¹
- Heartwater: There are several clinical forms of heartwater, a bacterial disease caused by *Ehrlichia ruminantium*. Most cases of heartwater are characterized by fever, respiratory distress, diarrhea, and, sometimes, neurologic signs. For more information on heartwater, please see the FAD PRoP Heartwater Etiology and Ecology SOP.²²
- Nairobi sheep disease: The tropical bont tick may serve as a vector for Nairobi sheep disease (NSD), a virus (family Bunyaviridae) which primarily affects sheep and goats in East and Southern Africa. This often fatal disease is characterized by fever, rapid breathing, anorexia, depression, and diarrhea. People may contract NSD, but it causes only a mild, influenza-like illness.²³
- Dermatophilosis: A skin disease caused by the bacterium *Dermatophilus congolensis*, dermatophilosis can be spread by fomites and direct contact as well as by ticks and other

¹⁷ Pegram RG, Rota A, Onkelinx R, Wilson DD, Bartlette P, BS Nisbett, Swanston G, Vanterpool P, de Castro JJ. 1996. Eradicating the tropical bont tick from the Caribbean. FAO Corporate Document Repository. Available at <http://www.fao.org/docrep/W2650T/w2650t06.htm>.

¹⁸ Pegram RG and Eddy C. 2002. Progress towards the eradication of *Amblyomma variegatum* from the Caribbean. *Experimental and Applied Acarology*. 28: 273-281.

¹⁹ Deem SL. 1998. A review of heartwater and the threat of introduction of *Cowdria ruminantium* and *Amblyomma* spp. Ticks to the American mainland. *Journal of Zoo and Wildlife Medicine*. 29: 109-133.

²⁰ Pegram and Eddy, 2002.

²¹ CFSPH (2), 2006.

²² USDA APHIS. 2013. Heartwater, Standard Operating Procedures Etiology and Ecology. Available at http://www.aphis.usda.gov/animal_health/emergency_management/downloads/sop/sop_heartwater_e-e.pdf.

²³ USDA APHIS. 2013. Nairobi Sheep Disease, Standard Operating Procedures Etiology and Ecology. Available at http://www.aphis.usda.gov/animal_health/emergency_management/downloads/sop/sop_nsd_e-e.pdf.

vectors. Signs include matted hair, scabbing, itching, and abscessed sores.²⁴

- African tick-bite fever: Humans bitten by either tick can become infected with *Rickettsia africae*, the bacterial agent of African tick-bite fever. This disease causes flu-like illness, with signs including fever, fatigue, nausea, muscle ache, rash, and headache.^{25,26}

1.4.5 Morbidity and Mortality

The harm to a host of bont or tropical bont ticks will depend on the extent of infestation; species, age, and condition of the host animal; and the specific effects of any transmitted infection caused by the tick's bite. Mortality rates from heartwater infections vary from 60–90 percent.²⁷

Screwworm infestations and dematophilosis often do not result in death, but both can weaken animals and lead to death if left untreated.²⁸ Dermatophilosis is the leading contributor to financial losses of producers and owners whose livestock are infested with tropical bont ticks in the Caribbean.²⁹

In addition to spreading disease and creating wounds on the skin or surface of a host, bont and tropical bont ticks can cause stress and detrimental blood loss to hosts. Hosts can typically endure being bitten by a few ticks, but more intense infestations, of dozens to hundreds of ticks per animal, are common in rural areas where heavy tick concentrations are maintained in wildlife species.³⁰

1.5 Environmental Persistence of Bont and Tropical Bont Ticks

Bont ticks and tropical bont ticks must feed on blood to survive, but they may take 2–4 years to complete their three life stages, during which they can spend well over 90 percent of the time in the environment.^{31,32} However, ticks often depend on certain microhabitats and vegetation types within wide-ranging ecosystems.³³ Acaricides are effective against both species, but susceptible host species must be treated often.³⁴

1.6 Bont and Tropical Bont Ticks in the United States

There is a risk that either species of tick could enter the United States on a wildlife host, an imported host animal, or travelers and/or their pets. Bont ticks have been documented on U.S.

²⁴ Center for Food Security and Public Health (3). 2006. Fast Facts Dermatophilosis. Available at http://www.cfsph.iastate.edu/FastFacts/pdfs/dermatophilosis_F.pdf.

²⁵ Edinburgh Infectious Diseases, The University of Edinburgh. 2013. "New study shows bacteria that cause African tick bite fever now infect ticks in Uganda." <http://www.eid.ed.ac.uk>.

²⁶ CDC. 2013. "African Tick-Bite Fever." <http://wwwnc.cdc.gov/travel/diseases/african-tick-bite-fever>.

²⁷ USDA APHIS, 2013.

²⁸ CFSPH (3). 2006.

²⁹ Pegram et al., 1996.

³⁰ Junquera P. 2013. "Amblyomma ticks on livestock, dogs, and cats. Biology, prevention, and control." Parasites of Livestock, Dogs, and Cats. Available at http://parasitipedia.net/index.php?option=com_content&view=article&id=2544&Itemid=2820.

³¹ CFSPH, 2006.

³² CFSPH (2), 2006.

³³ Levin ML. 2011. "Tick Control." *Merck Veterinary Manual*. Available at http://www.merckmanuals.com/vet/integumentary_system/ticks/tick_control.html.

³⁴ CFSPH, 2006.

travelers returning from Africa and on imported rhinoceroses.^{35,36} Introduction of bont or tropical bont ticks is of concern not only due to the direct damage they can do to their hosts (bite wounds, stress, blood loss), but also because there are many competent arthropod vectors, and domestic animal and wildlife hosts in the United States for the pathogens they may carry, particularly heartwater.³⁷

The tropical bont tick has spread throughout the Caribbean, once as far north as Puerto Rico. This, in combination with the presence of the cattle egret in the Florida Keys, led to the United States entering a coalition of international government agencies and non-profits to establish the Caribbean *Amblyomma* Program (CAP) to eradicate the tropical bont tick from certain islands (other members include Belgium, Germany, Italy, the United Kingdom, the Food and Agriculture Organization of the United Nations, the Inter-American Institute for Cooperation on Agriculture, and the Caribbean Community). The CAP program had varied success before ending in 2008, with six islands declared “provisionally free”, but re-infestations sometimes occurred, such as in St. Kitts in 2004.^{38,39}

³⁵ Burridge MJ, Simmons LA, Simbi BH, Mahan SM, Fournier PE, Raoult D. 2002. Introduction of the exotic tick *Amblyomma hebraeum* into Florida on a human host. *Journal of Parasitology*. 88(4): 800–801.

³⁶ Wilson DD, Richard RD. 1984. Interception of a vector of heartwater, *Amblyomma hebraeum* Koch (Acari: Ixodidae) or black rhinoceroses imported into the United States. *Proceedings, Eighty-eighth Annual Meeting of the United States Animal Health Association*. 301–311.

³⁷ Pegram et al., 1996.

³⁸ Pegram et al., 1996.

³⁹ Ahoussou S, Lancelot R, Sanford B, Porphyre T, Bartlette-Powell P, Compton E, Henry L, Maitland R, Lloyd R, Mattioli R, Chavernac D, Stachurski F, Martinez D, Meyer DF, Vachieri N, Pegram R, Lefrançois T. 2010. Analysis of *Amblyomma* surveillance data in the Caribbean: Lessons for future control programmes. *Veterinary Parasitology*.167: 327–335.

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USDA APHIS. 2013. Nairobi Sheep Disease, Standard Operating Procedures Etiology and Ecology. Available at http://www.aphis.usda.gov/animal_health/emergency_management/downloads/sop/sop_nsd_e-e.pdf.

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Attachment 1.B Abbreviations

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| APHIS | Animal and Plant Health Inspection Service |
| CAP | Caribbean Amblyomma Program |
| CDC | Centers for Disease Control and Prevention |
| CFSPH | Center for Food Safety and Public Health |
| FAD PReP | Foreign Animal Disease Preparedness and Response Plan |
| OIE | World Organization for Animal Health |
| NAHEMS | National Animal Health Emergency Management System |
| NSD | Nairobi sheep disease |
| SOP | standard operating procedure |
| TDD | telecommunications device for the deaf |
| USDA | United States Department of Agriculture |